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Erysipelothrix monocytogenes Infection in Piglets

BY

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AND

E. THORPE

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SUMMARY.—1. *An outbreak of* Erysipelothrix monocytogenes *infection in piglets in Scotland is described.*

2. *The findings are compared with the disease described in America.*

In the course of an investigation into the causes of death in suckling pigs, *Erysipelothrix* (*Listeria: Listerella*) *monocytogenes* infection was found on one farm. Since this organism has not previously been described as a pathogen of pigs in Britain and since comparatively little is known of the diseases of unweaned pigs, it is thought worthwhile recording this small outbreak. (The disease is widely known as listeriosis and is hereafter referred to as such.)

Farm History

The piggery was a small unit on a commercial dairy farm, only 12 Large White sows being kept. Piglets were reared to 3 months of age and sold as stores. The farmer claimed a good record in rearing and had not previously experienced deaths other than these ascribed to "crushing," etc. On several occasions he had noticed pregnant sows and gilts going off their food during a short febrile illness of 2 or 3 days' duration; this usually took place about a fortnight before farrowing and had occurred in the sow whose litter is described here. The piglets were born healthy and throve well for 3 weeks when one died suddenly; this animal was not available for examination. One week later a second pig (Case 1 below) died and was submitted to the laboratory. A tentative diagnosis of listeriosis was made and the farm was visited.

The remainder of the litter appeared lively and well but while they were being inspected one piglet suddenly developed an epileptiform convulsion, showed nystagmus and opisthotonus and fell over backwards. It then regained its feet and carried on in a manner indistinguishable from the other animals. No other abnormalities were seen.

One week later a third piglet of this litter died and was submitted (Case II below). This animal was said to have been dull and anorexic a fortnight before and had shown some lameness of left fore and hind limbs.

A few days later 3 further deaths occurred in another 3-week-old litter and shortly afterwards several stillbirths from yet another sow were sent for examination. No further deaths were reported.

Laboratory Findings

Case 1.—Four-week-old Large White piglet.

At autopsy the only lesions seen were multiple small hepatic necroses ranging from pinhead size to 0.5 cm. in diameter. Gram-stained smears from the cut surface of the liver showed large numbers of small gram-positive rods with the morphology of *E. monocytogenes.*

Histological examination showed the liver lesions to be multiple focal necroses (Fig. 1). There was little inflammatory cell reaction at the periphery of the necrotic areas, but there was a marked periportal infiltration of macrophages and lymphocytes (Fig. 2)

with a smaller proportion of polymorphs. Organisms were easily demonstrated in these lesions (Fig. 3). Microscopic lesions were not found in the sections taken from the medulla and cerebellum, but in the cerebral cortex lesions of the typical "micro-abscess" type were present (Fig. 4). These consist of small areas of focal necrosis infiltrated with cells, polymorphs being most prominent among the latter.

An organism was recovered from the liver and lungs; this had the morphological, biochemical and cultural characteristics, and the experimental pathogenicity of *E. monocytogenes*.

Case II.—Large White piglet, five weeks old.

At autopsy no macroscopic lesions were seen.

Histological examination of the C.N.S. showed the small round cell foci of late stage "micro-abscesses" in the medulla and proximal spinal cord. Perivascular cuffing by macrophages, lymphocytes, and occasional plasma cells were also present.

No organisms were recovered on culture of brain and liver, and biological findings using mice were also negative; this piglet had received penicillin injections and this may have influenced the bacteriological findings.

Three further deaths in another 3-week-old litter occurred a week later. These piglets had received penicillin injections. The *post-mortem* findings were similar in all three cases, consisting of petechiation of the viscera. No significant histopathological or bacteriological findings were obtained. An agglutination test on sera taken from the sows at the farm using the organism isolated from Case I as antigen failed to show the presence of agglutinating antibodies.

Discussion

E. monocytogenes was first isolated from experimental rabbits by Murray *et al.* (1926). Since then it has been described as a pathogenic agent in Great Britain in cattle (Harbour, 1941; Jones, 1954; Dickie *et al.*, 1958), in poultry (Paterson, 1937), in sheep (Paterson, 1940; Young, 1956) and in moles (Levi, 1948).

The disease in pigs is well recognised in America but has not been recorded previously here. It appears to occur in two principal forms, *viz.* septicaemic and encephalitic. The organism has on occasion been isolated from unthrifty piglets. Sudden deaths in 5-day-old piglets which had focal necrosis of the liver were noted by De Bluck (1942) and similar clinical cases with the *post-mortem* appearance of septicaemia were recorded by Graham (1949) and Smith (1956). The latter author described a hitherto unrecorded myocarditis, haemorrhagic enteritis and lymphadenitis of the mesenteric nodes in this condition.

Encephalitis associated with listeriosis has been described on several occasions by American workers (Buster, 1940; Helmboldt, 1951; Evereth, 1953). The principal clinical signs described are a stiff gait of the forelimbs resembling tetanus, with the development of progressive inco-ordination and posterior paralysis. "Circling" has also been reported. On the farm described in this paper, vague illness with anorexia for several days was recorded as occurring in the adult pigs prior to deaths in the piglets, and this finding has been noted in several of the American reports.

Definite diagnosis can be established only on bacteriological and pathological examinations. The histological lesions of the brain are characteristic of, if not specific for, the disease in the bovine, sheep and pig. They are most commonly found in the medulla, pons and cerebellar brachii, although other parts of the brain may be affected. They consist of the "micro-abscesses" as described in Cases I and II, together with a moderate degree of round cell cuffing of blood vessels. The finding of these lesions even in the absence of recovery of the organism should lead to strong suspicion of listeriosis. Occasionally large areas of necrosis are found in the brain (Helmboldt, 1951). A well developed round cell meningitis is not a common finding in the porcine disease, whereas it occurs regularly in sheep affected with listeriosis.

The isolation of *E. monocytogenes* from unthrifty piglets has been recorded by Kerlin (1945) and Delay (1954). Focal hepatic necrosis was a common finding in these chronic cases.

The findings in Case I agree closely with the pathological descriptions given by American authors of the septicaemic type, while Case II has the histopathological lesions associated with the encephalitic form of the disease. The later group of sudden deaths could not be proved to be due to *E. monocytogenes* infection but the therapeutic use of penicillin may have modified the bacteriological picture.

Acknowledgments.—We wish to thank Mr. A. McKenzie, M.R.C.V.S., Gartocharn, for the material and Mr. M. Grindlay, DIP.BACT., M.R.C.V.S., for carrying out the bacteriological examinations.

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W. F. H. JARRETT, W. I. M. McINTYRE & E. THORPE—*ERYSIPELOTHRIX MONOCYTOGENES* INFECTION IN PIGLETS

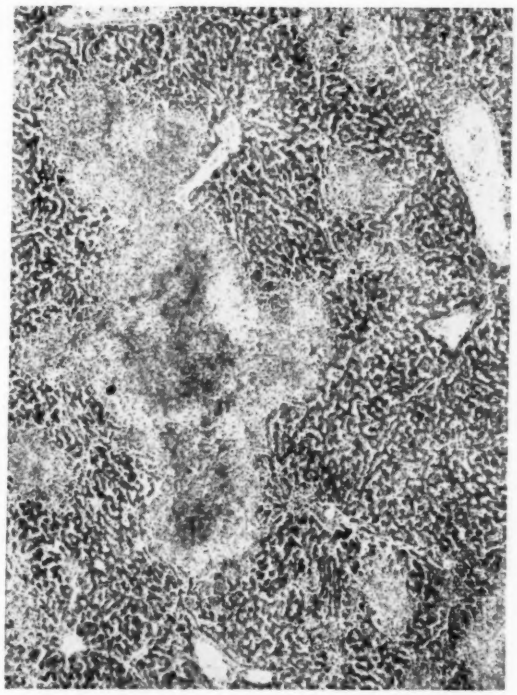

FIG. 1.—Liver. Multiple focal necroses. H. & E. × 35.

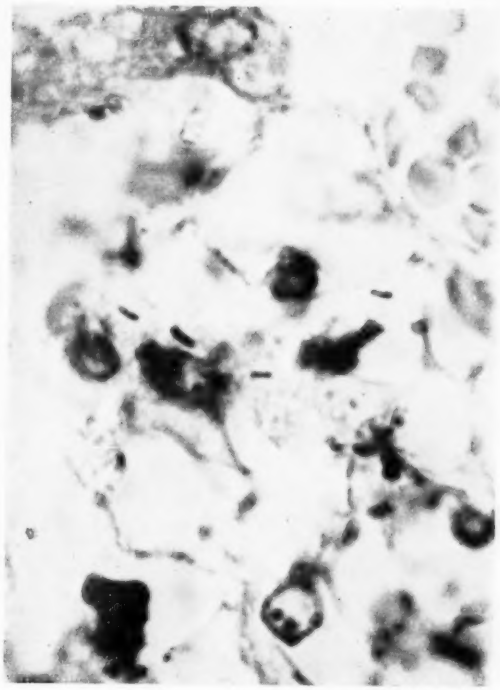

FIG. 3.—Liver. Organisms in hepatic lesions. Gram. × 2,000.

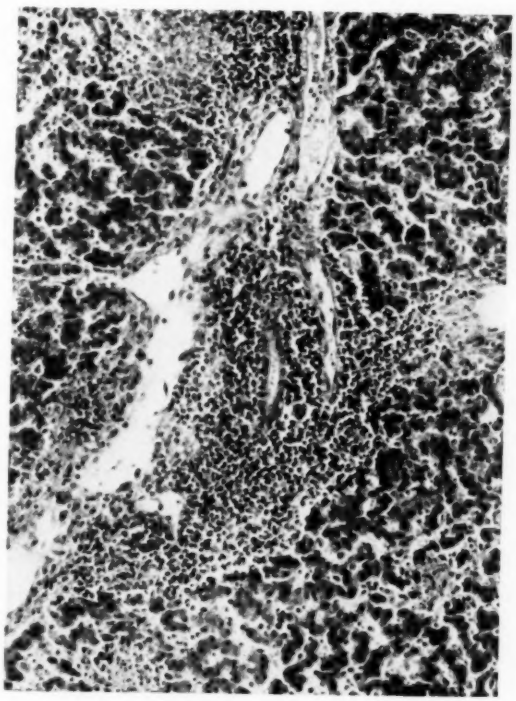

FIG. 2.—Liver. Periportal cellular infiltrate. H. & E. × 110

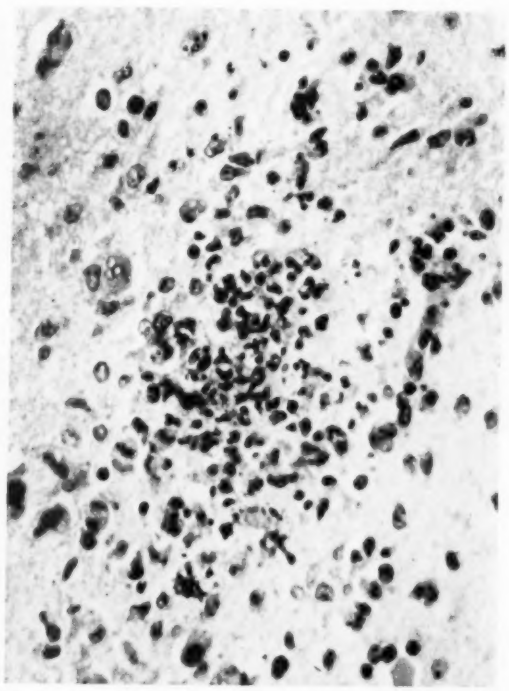

FIG. 4.—Cerebral cortex. "Micro-abscess." H. & E. × 400.

Progress in the Artificial Insemination of Swine—Some Factors Influencing Fertility Levels in its Field Application

BY

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SUMMARY.—Progress in pig A.I. in Hampshire is described. An analysis of the inseminations performed in 1957 is detailed. The following trends are demonstrated:—

(i) *An improvement in results compared with earlier work has been achieved.*

(ii) *Two of the optima for success are the riding of the female by the farmer and the presence of mucus at the vulval lips.*

(iii) *One technician's ability has increased beyond the others'.*

(iv) *The first heat after weaning is probably more fertile than subsequent heats.*

(v) *If the first heat occurs within 5 days of weaning, fecundity is probably greater than if it occurs thereafter.*

(vi) *The optimal time for inseminating sows is probably towards the end of the first day of heat.*

(vii) *No indication of lowered fertility through the attenuation of the semen through age was observed up to 7 hours old.*

(viii) *Large White boars produced higher fertility and larger litters than Landrace boars.*

(ix) *Average litter sizes and fertility may be interrelated.*

Introduction

STIMULATED by Polge's successful work at the Cambridge A.R.C. Unit of Reproductive Physiology during 1954, investigations into the field aspects of pig A. I. in Hampshire by this laboratory commenced early in 1955.

Because of the popularity of the breed at that time, Landrace boars were purchased and a free service was inaugurated to encourage pig breeders to make females available for experimental insemination. Considerable difficulties in the collection of semen were encountered, owing largely to the sluggish libido and weak hind quarters frequently found in boars of that breed in this country (Madden, 1956). Semen was thus, at first, only available intermittently and was used on pigs provided spontaneously on request who were at a stage which only coincidentally approximated oestrus. Of 27 pigs inseminated with semen diluted in the glycine diluent of Roy and Bishop (1954) at an average dilution rate of 1:4, only one farrowed (Table I). Although neither the raw nor the diluted semen appeared to be of good quality, it was nevertheless used about 17 hours after collection since no comparative criteria were available.

During the latter part of 1955, a team of 4 Landrace boars, from whom semen could be collected at nearly every attempt, was accumulated. The author observed that the quality of the ejaculate, as judged by initial motility and diluted longevity, appeared to improve with the sex drive of the individual boar. Semen was collected early in the morning, each boar ejaculating about once every 4 days. It was filtered through sterile muslin into a warmed cylinder and diluted at about 20° C. at the rate of 1 part to 4. Most of this semen was used within 10 hours of collection. Two Large White boars were then added to the stud and it was immediately noticed that they had much greater libido and were infinitely more easily collected from than those Landrace boars to whom experience had been limited hitherto. Until December, 1956, a rubber catheter of 14 mm. outside diameter with a narrow bore was used for insemination, the semen being introduced by squeezing an attached plastic bag containing it.

TABLE I
OVERALL RESULTS

Period	First inseminations		Repeat inseminations		Technique used
	Number of pigs	Farrowed	Number of pigs	Farrowed	
May to Aug., 1955	27– 1	4%	— —	—	Polge 14-mm. rubber catheter
Sept. to Dec., 1955	66– 16	24%	11– 3	27%	" " " "
Jan. to Dec., 1956	634–178	28%	229– 63	28%	" " " "
Jan. to Dec., 1957	1,146–512	45%	451–152	34%	Aämdal inflatable cuff

Planned Developments

From 1956 onwards the work was kept confined, as far as possible, to that performed by 4 operators only, so that experience of the behaviour of the available pigs could be condensed into as few men as possible.

An attempt to correlate pig keepers' criteria for the optimal service time was thus made. The view was taken that farmers should have much more capably judged this stage than the visiting technician, who had only a limited amount of time at his dis-

posal. It was hoped that the technicians would learn a great deal about oestral characteristics in this way. Gradually, however, the impression was acquired that, owing to the prevailing custom in the district of leaving sows for some days at a boar stud for natural mating, true oestrus was rarely witnessed and not at all reliably appreciated by the pig owners themselves.

A detailed questionnaire was prepared and a system of scoring devised, so that results could be related to the prediction of the chances of success made by the inseminator at the time of insemination. All the information gleaned was transposed on to punch cards (Fig. 1) for ease of sorting the data. Information regarding the returns to oestrus and ultimate farrowings was sought by a rigorous collection of data on prepaid postcards at intervals of about 24, 46, and 125 days after insemination.

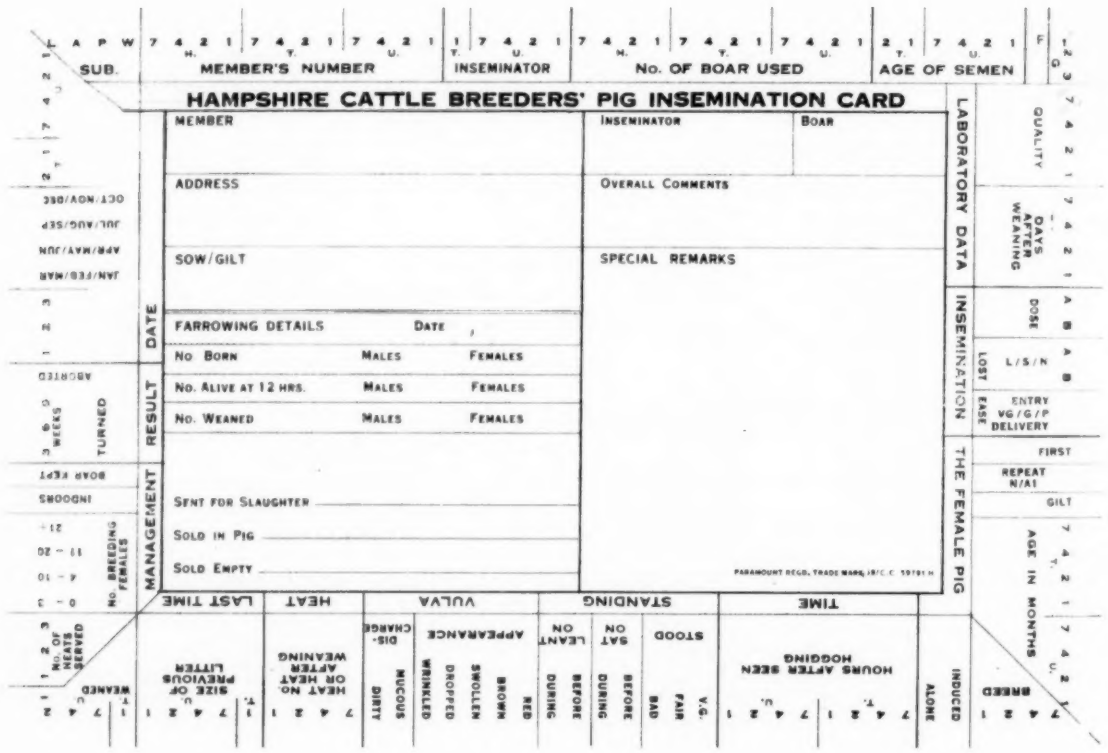
In January, 1957, after a month's practice with the Norwegian technique, the 4 operators changed their apparatus to the 7-mm. diameter plastic pipette with an inflatable cervical cuff as recommended by Aamdal (1956, 1957). The technique used for the inseminations analysed in this paper was identical with Aamdal's except that a 2 per cent. glycine 30 per cent. egg yolk diluent was used instead of the citrate buffer described by the Norwegians, because longevity did not appear to be reliably improved in the latter. The semen was kept at about 20° C. from collection to the time of insemination. 100 c.c. of diluted semen was used for each service.

Overall Results

Table I shows chronologically the number of pigs inseminated, the number of these that farrowed, and the progressive improvement in farrowing rate experienced. The levels of fertility, gained until the end of 1956, were so low that, as could be expected, little correlation could be discovered between the factors involved (*cf.* Holt, 1958). A significant rise in fertility was obtained in 1957 and the data for that year are analysed in this paper.

Progress

The poor initial results were interpreted by the author to mean that very few of the pigs had ovulated sufficiently closely to the insemination time. Nevertheless, a proportion of the pigs farrowed, despite the mistiming, indicating that the apparatus and procedure were, at least, capable of producing results. The insemination technique appeared to be so independent of skill that even operators who had had little practice could have used it as effectively as an experienced man. It had produced good levels of fertility where oestrus had been assessed by coitus with a vasectomised boar (Polge, 1954). The author reasoned that the majority of pigs offered for service would, however uncritically judged, be approximately in oestrus. The life of the diluted semen was, in general, not more than 12 hours. Random timing could result in insemination being performed (a) too early, (b) too late, or (c) near ovulation time.



resulting in one-third of them farrowing. 86 per cent. of 542 sows, subsequently inseminated in this trial, had farrowed previously after natural service at one oestrus. The third (29 per cent.) which farrowed in the insemination trials up to December, 1956, appeared to be too close to the predicted percentage on this basis to be coincidental. Efforts were therefore concentrated upon improving the timing factor. At the same time, however, a change was made to the Norwegian type of inflatable catheter, this being demonstrably more mechanically effective in semen deposition in *post-mortem* specimens.

An intensive indoctrination of the fieldsmen was carried out, concerning the optimal requirements for insemination as far as these were known. This basically required the pig to stand absolutely still, whilst being ridden by the owner and requested notification of the reddening and swelling of the vulva prior to the visit. Considerable opposition was met with, in that both technicians and pig farmers could not eliminate from their minds the recollection of pigs which had farrowed successfully, despite having behaved suboptimally at the time of service. Repeated suggestions were made that, if progress were to be forthcoming, it was essential that these aberrant pigs should be forgotten. Only then could the general optimal pattern of behaviour be learnt and evaluated. This teaching met with a varying response from the individual technicians involved. The operator "A." working in the same area as the author, and thereby subjected to a more intensified campaigning, was the first to appreciate the great significance of the presence of the oestral characters mentioned above. His results in 1957 bear out this contention in a remarkable way (Table II). By the beginning of that year he had had 15 months' experience, as had also the farmers in his territory.

not reject proportionately any more pigs presented for service than the other operators involved. There was no correlation between the technical efficiency of inseminating of different operators, as measured by the amount of semen lost and fertility levels obtained.

The totals in Table II also show clearly that there was a difference between the farrowing results of sows and gilts. There was also a difference between the levels of fertility of first inseminations and repeat inseminations. As with natural service, the average litter sizes were greater for sows than with gilts. The average number born in each group was lower than those obtained by natural service.

The Optimal Service Behaviour and Its Assessment

Part (i) of Table III demonstrates the effectiveness of inseminator "A" in his judgment of the suitability of the oestral sow for insemination. He was less able to predict the results with gilts. Even the operators with poorer results were capable of judgment to some extent but the comparative uncertainty of their evaluation may be seen to be reflected in the high proportion of inseminations about which they were unable to predict the chances of success at all ("No Comment" (Part ii), Table III).

The predictions of success were based on an overall opinion of the prevailing circumstances at the time of each insemination. The main oestral characteristics observed are outlined in Table IV and compared with the fertility levels obtained.

For each of the main oestral signs observed, the farrowing rates were higher where the character existed, compared with the results obtained where it was absent or not observed (Table IV). It may also be seen from this table, that gilts were more restless than sows at the time of insemination. A far greater proportion of gilts showed a reddening

TABLE II
ANALYSIS OF RESULTS, 1957

1957	Sows			Gilts		
Inseminators	Firsts	Repeats	Total	Firsts	Repeats	Total
A ...	272–158 58%	68–35 52%	340–193 57%	180– 84 47%	75–29 39%	255–113 44%
B ...	109– 45 41%	45–15 33%	154– 60 39%	67– 21 31%	28– 9 32%	95– 30 32%
C ...	185– 83 45%	76–19 25%	261–102 39%	160– 59 37%	71–14 20%	231– 73 32%
D ...	51– 21 41%	24–12 50%	75– 33 44%	40– 7 18%	26– 5 19%	66– 12 18%
Others ...	54– 28 52%	13– 7 54%	67– 35 52%	28– 6 21%	25– 7 28%	53– 13 25%
Total ...	671–335 50%	226–88 39%	897–423 47%	475–177 37%	225–64 28%	700–241 34%
Average litter size ...	10·5	9·9	10·4	8·3	8·5	8·4

Analysis of Results, 1957

There is a strikingly significant difference between the farrowing rates gained by different technicians (Table II). It should be remembered, however, that the enthusiastic inseminator with critical ability would, at the same time, inevitably imbue the farmers in his area with the criteria for satisfactory results. Consequently they probably offered him relatively more pigs in this stage of oestrus for insemination. Significantly, inseminator "A" did

of the vulva and swelling of the vulval lips than did sows. There is a strong indication that, of the factors tabulated, for both sows and gilts, the major requirements for successful fertility with artificial insemination in pigs, using diluted semen whose longevity is not very protracted, are that of standing "like a rock" to be ridden and the presence of mucus at the vulval lips. Reddening and swelling of the vulva appear to be only coincidental signs of oestrus and are not critically indicative of the correct time for

TABLE III
THE OPTIMAL SERVICE BEHAVIOUR AND ITS ASSESSMENT

1957	Sows			Gilts		
Judgment	Firsts	Repeats	Total	Firsts	Repeats	Total
Part (i) "A"						
Very good ...	171–116 68%	36–24 67%	207–140 (11·1) 68%	101–51 50%	36–19 53%	137–70 (7·9) 51%
Fair	62– 30 48%	20– 8 40%	82– 38 (11·8) 46%	50–27 54%	26– 9 35%	76–36 (8·3) 47%
Poor ...	21– 5 24%	7– 1 14%	28– 6 (13·3) 21%	18– 3 17%	6– 1 17%	24– 4 (12·0) 17%
No comment	18– 7 39%	5– 2 40%	23– 9 (11·0) 39%	11– 3 27%	7– 0 0%	18– 3 (11·2) 17%
Part (ii) Others						
Very good ...	145– 74 51%	40–14 35%	185– 88 (10·0) 48%	88–34 39%	35– 7 20%	123–41 (8·3) 33%
Fair	72– 33 46%	50–12 24%	122– 45 (9·9) 37%	56–12 21%	28– 9 32%	84–21 (8·6) 25%
Poor ...	21– 6 29%	10– 4 40%	31– 10 (8·2) 32%	28– 7 25%	7– 2 28%	35– 9 (8·0) 26%
No comment	161– 64 40%	58–23 40%	219– 87 (10·7) 40%	123–40 33%	80–17 21%	203–57 (8·1) 28%

Average litter sizes are shown in brackets.

TABLE IV
RESULTS BY OESTRAL CHARACTERS

Oestral characters	Sows			Gilts		
	Firsts	Repeats	Total	Firsts	Repeats	Total
Stood well ...	331–183 55%	106–45 42%	437–228 52%	167– 82 49%	80–27 34%	247–109 44%
Moved ...	340–152 45%	120–43 36%	460–195 42%	308– 95 31%	145–37 26%	453–132 29%
Mucus	346–191 55%	108–48 44%	454–239 53%	226–102 45%	92–24 26%	318–126 40%
None	325–144 44%	118–40 34%	443–184 42%	249– 75 30%	133–40 30%	382–115 30%
Reddened ...	248–133 54%	114–44 39%	362–177 49%	376–150 40%	158–41 26%	534–191 36%
Not reddened ...	423–202 48%	112–44 39%	535–246 46%	99– 27 27%	67–23 34%	166– 50 30%
Swollen ...	419–215 51%	166–69 42%	585–284 49%	425–164 39%	196–56 29%	621–220 35%
Not swollen ...	252–120 48%	60–19 32%	312–139 45%	50– 13 26%	29– 8 28%	79– 21 27%

insemination. These two signs are clearly more easily observed in gilts than in sows. It is our impression that that stage should have just passed. The vulva should be less turgid, more wrinkled, and show mucus at the ventral commissure.

During the course of the work it was postulated that the visible signs of oestrus might be more critically observed in pigs whose external genitalia were non-pigmented and that fertility might therefore be higher in white pigs. Table V entirely negates this supposition but incidentally demonstrates that the majority of the female population in this trial were white pigs.

TABLE V

Vulval colour	Sows	Gilts	Total
White ...	533–255 48%	494–174 35%	1,027–429 42%
Pigmented	364–168 46%	206– 67 33%	570–235 41%
Total	897–423 47%	700–241 34%	1,597–664 42%

The Critical Ability of Inseminator "A"

The marked overall effect on the level of fertility gained in this field trial by operator "A" has been demonstrated. Table VI shows an analysis of this inseminator's work, according to the presence or absence of the main oestral signs upon which he made his predictions.

It may be seen clearly that the only observed oestral characters which had any marked influence on his results were "Stood Well" and the presence of vulval mucus. Moreover, when these strong influences are removed from the total figures for each group, the overall effects noted in Table IV are considerably lessened. Although the populations in these groups are very small to review statistically, the author is convinced of the importance and reliability of the trends shown. The inseminator "A" is consistent in his results. That he has developed critical ability beyond that of his colleagues is almost certain. In his experience there is a particular time during oestrus, generally towards the end of the first day, when the female will stand very much more firmly and persistently than at others. At this time mucus is frequently to be found at the vulval lips.

Post-Weaning Interval

Commonly a sow will come into heat 5 to 6 days after weaning (Marshall & Hammond, 1947), largely dependent on the nutritional state. Four hundred and fifty-nine sows in this field trial were inseminated at the first heat after weaning, 243 of these farrowing (53 per cent.). Those inseminated at subsequent heats for the first time totalled 212 of which 92 farrowed (44 per cent.). This suggests that the first heat after weaning may be more fertile than subsequent heats. Only 19 of the latter had been pre-

TABLE VI
CRITICAL ABILITY OF INSEMINATOR "A"

Inseminator "A" only	Sows		Gilts		Total	
Stood well	175–122	70% (41%)	86– 51	59% (36%)	261–173	66% (39%)
Moved	165– 71	43% (43%)	169– 62	37% (25%)	334–133	40% (33%)
Mucus	208–131	63% (44%)	114– 55	48% (35%)	322–186	58% (40%)
No mucus	132– 62	47% (39%)	141– 58	41% (24%)	273–120	44% (32%)
Reddened	94– 54	57% (50%)	182– 83	46% (31%)	276–137	50% (37%)
Not reddened	246–139	56% (37%)	73– 30	41% (22%)	319–169	53% (34%)
Swollen	194–112	58% (44%)	238–104	44% (30%)	432–216	50% (37%)
Not swollen	146– 81	55% (36%)	17– 9	53% (19%)	163– 90	55% (31%)
Total	340–193	57% (41%)	255–113	44% (29%)	595–306	51% (36%)

(In brackets : The farrowing rate obtained by the other inseminators for the same group for comparison.)

viously served by boars and were subsequently inseminated after returning to service; 11 of these farrowed after being inseminated once (58 per cent.). The reasons for the high proportion of sows (31 per cent.) served neither naturally nor by A.I. at the first heat after weaning are not known.

The post-weaning to first oestrus interval in the group studied, spanned a greater period than was expected: 2 per cent. came into season prior to the fourth day; 12 per cent. on the fourth day; 35 per cent. on the fifth day; 16 per cent. on the sixth day; 16 per cent. on the seventh day; 6 per cent. on the eighth day; and 13 per cent. on subsequent days up to 14 days post-weaning. This great variation may testify to the widely differing nutritional levels at which the individuals involved were maintained.

Of 196 inseminated sows which came into season up to the end of the fifth day after weaning, 111 farrowed (57 per cent.). Of 200 sows inseminated after the fifth day 97 farrowed (49 per cent.).

Timing of Insemination

It has been commonly suggested that the second day of oestrus is optimal for service, but the onset of oestrus cannot be reliably known in a field trial of this nature, particularly if this occurs overnight. Table VII possibly emphasises this limitation, in that the results do not show that there was a particularly favourable time related to the reported time of onset.

TABLE VII

Hours after onset	Sows	Gilts	Total
1–10	40– 22 55%	22– 9 41%	62– 31 50%
11–19	11– 9 82%	7– 2 29%	18– 11 61%
20–24	272–139 51%	190–59 31%	462–198 43%
25–29	160– 82 51%	100–31 31%	260–113 43%
30–39	79– 33 42%	46–16 35%	125– 49 39%
40–49	182– 71 39%	151–56 37%	333–127 38%
50–59	73– 27 37%	79–31 39%	152– 58 38%
60+	55– 28 51%	84–33 39%	139– 61 44%
Unknown	25– 12 48%	21– 4 19%	46– 16 35%

Broadly, however, there was an overall tendency for higher fertility if the insemination was performed in the first 24 hours of oestrus (Table VIII) but this was only upheld by sow inseminations and there appeared to be a reverse tendency for gilt inseminations.

Age of Semen

The progressive motility of the diluted semen apparently deteriorated by the end of 10 hours but reliable evaluation was judged not to be possible in the opaque diluent used. There was, however, an indication that the fertility was not impaired by the ageing of the semen up to 10 hours old (Table IX).

In general, the microscopic appearance of the diluted semen used in the period under review did not permit its use on the day after collection. Only 4 inseminations were performed with the semen over 24 hours old and only one of these farrowed. Subsequent experience (Madden, 1958) with semen of much better initial quality, appears to support the contention that the semen was in a state of anabiosis (Niwa, 1958; Polge, 1954).

Comparative Fertility of Boars

Table X gives the farrowing rates obtained by the individual boars. The low number of inseminations for certain boars is indicative of the collection difficulties experienced or deficiencies in the ejaculates obtained. Whereas the libido of LW 1 was good, the raw semen was largely dead and the gel

TABLE VIII
HOURS AFTER ONSET OF OESTRUS

Hours after onset	Sows	Gilts	Total
First 24 hours	323–170 (10·4) 53%	219– 70 (8·0) 32%	542–240 (9·8) 44%
25–49 hours	421–186 (10·4) 44%	297–103 (8·4) 35%	718–289 (9·9) 40%
Over 49 hours	128– 55 (11·2) 43%	163– 64 (8·7) 39%	291–119 (9·7) 41%
Unknown	25– 12 (9·7) 48%	21– 4 (7·0) 19%	46– 16 (9·0) 35%

The average litter sizes are shown in brackets.

TABLE IX
AGE OF SEMEN

Age of semen	Sows			Gilts			Total		
Up to 4 hours old	350–167	(10·4)	48%	287–102	(8·3)	36%	637–269	(9·6)	42%
5 to 7 hours old	417–198	(10·7)	48%	322– 99	(8·4)	31%	739–297	(10·0)	40%
8 to 10 hours old	110– 47	(10·0)	43%	87– 38	(8·1)	44%	197– 85	(9·1)	43%
Unrecorded	20– 11	(8·2)	55%	4– 2	(6·0)	50%	24– 13	(7·8)	54%

Average litter sizes are shown in brackets.

fraction was frequently dispersed as a slime throughout the semen instead of existing as relatively discrete lumps as is found in normal ejaculates. He was an inconclusive blood reactor to Brucella. LR 2 had very low sex drive and the semen was of poor quality as judged by initial motility and longevity in the diluent.

was complete in 5 days. Ejaculates used from him prior to the onset produced a farrowing rate of 55 per cent. with an average of 13.3 piglets born. From 4 consecutive ejaculates during the following 3 weeks after complete clinical recovery, 28 pigs were inseminated and only 3 farrowed (11 per cent.) with an average of 8.0 piglets being born. Subsequently

TABLE X
COMPARATIVE BOAR RESULTS

Boars	Sows			Gilts			Total		
Large White 1	69– 23	(11·2)	33%	63– 16	(9·0)	25%	132– 39	(10·5)	30%
" " 2	206–102	(11·9)	50%	145– 66	(9·3)	46%	351–168	(10·9)	48%
Landrace 1	196– 92	(10·5)	47%	154– 53	(8·2)	34%	350–145	(9·6)	42%
" 2	16– 5	(6·3)	31%	13– 3	(9·0)	23%	29– 8	(7·0)	28%
" 3	239–125	(10·2)	52%	192– 61	(7·9)	32%	431–186	(9·5)	43%
" 4	171– 76	(9·8)	44%	133– 42	(7·6)	32%	304–118	(9·0)	39%
Total	897–423	(10·4)	47%	700–241	(8·4)	34%	1,597–664	(9·8)	42%

Average litter sizes are shown in brackets.

In view of the overwhelming field influence on results by the females, according to the stage of oestrus in which they were inseminated, together with the rather low overall resultant fertility, it was not unexpected that only gross differences between the fertility of individual boars could be detected. There is little doubt that there is a correlation between the poorest semen producers (LW 1 and LR 2) and the lowest fertility (29 per cent.). Similarly, the semen of LW 2 was of undoubtedly the best quality obtained from the boars used and the farrowing rate obtained with his semen was the highest (48 per cent.).

The general health of the boars was good. All were tuberculin tested and free from brucellosis with the exception of LW 1 as aforementioned. All were inoculated with crystal violet vaccine and against swine erysipelas. LW 2 developed acute erysipelas in spite of this. With penicillin treatment recovery his fertility rose to 59 per cent. in the following 3 weeks with an average litter size of 11.3.

Returns to Service

Although the optimal insemination time appears to be critical and difficult to judge, pig farmers seem readily able to recognise the approaching signs of oestrus. Of the 993 females that did not farrow 72 per cent. were reported to be in heat about 3 weeks after the insemination; 18 per cent. more were notified after about 6 weeks and 6 per cent. at 9 weeks. The above percentage of returns would probably have not been so high at 3 weeks if the information had not been sought diligently.

Eleven sows and 11 gilts (2.5 per cent.) did not return to heat until full term, when they came into oestrus instead of farrowing down. There were only 12 cases of abortion recognised and reported (1.3 per cent.). Eight of these were in gilts and 4

TABLE XI
PSEUDO-PREGNANCIES AND ABORTIONS

Quarterly	Sows				Gilts			
	Number done	Percentage farrowed	Abortions	Full-term returns	Number done	Percentage farrowed	Abortions	Full-term returns
Jan.–Mar. ...	231– 94	41	2	7	162– 54	33	2	4
Apr.–June ...	236–115	49	2	2	242– 79	33	6	2
July–Sept. ...	200–100	50	0	2	144– 46	32	0	2
Oct.–Dec. ...	230–114	50	0	0	152– 62	41	0	3
Total ...	897–423	47	4	11	700–241	34	8	11

in sows. All the boars were implicated in both aberrations, but LW 2, whose fertility was highest, was the least involved, having only 1 abortion and 2 full-term returns against his name. There was no particular season of the year when abortions or "pseudopregnancies" prevailed, except for a slight tendency to occur after insemination in the early months of the year when the fertility was lower than thereafter (Table XI).

For the purposes of investigating the fertility data contained in this communication, pigs which had a recognisable abortion were recorded as having farrowed.

Herd Experience

These data have yet to be analysed fully. At present there appears to be a difference from other areas in which pig A.I. trials have been carried out (Holt, 1958; Polge, 1956), in that fertility was not higher in larger herds and there was no increase in fertility as the farmers' experience grew in the period surveyed.

Litter Sizes

The average number of piglets born per litter (9.8) appears to be lower than the national average in recorded herds (11.0) (Hammond, 1956, 1957). The average for sows (10.4) was higher than that for gilts (8.4) (Table X) as occurs with natural service. Five hundred and forty-two of the sows involved in this field trial had an average of 10.9 piglets born from the immediately preceding pregnancy as a result of natural service, exactly comparable with the national figure for crossbreds.

A greater average litter size was obtained in the A.I. trial, using semen from Large White boars (10.8) than the average with Landrace semen (9.4), although a considerable proportion of the inseminations performed were deliberate breed crosses. It is interesting to note that in the National Pig Records for pedigree pigs, Large Whites averaged 11.4 and Landrace 10.1 piglets born, showing a similar breed difference.

The boar LW 2 whose fertility was highest also achieved the highest average litter size (10.9) (Table X). Similarly the technician "A," whose inseminations resulted in the highest fertility, also achieved the highest average litter size for sows (11.2) (Table XII). In addition, the other inseminators' average litter sizes appeared to be related to the percentage of sows farrowing after their individual inseminations. A similar trend was not apparent in the average litter sizes for gilts.

TABLE XII

Technician	Sows		Gilts	
	Percentage farrowed	Average litter size	Percentage farrowed	Average litter size
A ...	57	11·2	44	8·4
B ...	39	9·9	32	8·4
C ...	39	9·6	32	8·3
D ...	44	10·1	18	8·6
Others ...	52	10·6	25	9·4

As with fertility levels, no correlation was found between average litter sizes and the size of the effective dose of semen retained after insemination. Furthermore, despite the apparently poor viability of the diluted semen, no drop in litter size due to the age of the semen up to 7 hours old, could be demonstrated (Table IX). Similarly no correlation was demonstrated between litter size and the optimal signs of oestrus (Table III).

The average litter size related to the interval between the onset of oestrus and the insemination time, revealed no evidence determining the time of ovulation save that it is probably protracted (Table VIII).

As with fertility, the average litter size for sows inseminated within five days of weaning was higher at 11.2 when compared with 10.5 for those inseminated 6 days or more after weaning.

The average litter size for sows' first services was 10.5 compared with 9.9 for repeat services whereas that for repeat service gilts was slightly higher (8.5) than for first services (8.3).

Discussion

It is appreciated that care must be taken in assessing the significance of small numbers of inseminations as presented in this communication. Certain trends have been quite clearly demonstrated, however, and there is no doubt that considerable progress has been made in the establishment of a commercial pig A.I. service in Hampshire. Recent discussions (1958) with Niwa concerning the considerable volume of successful Japanese work provided every hope that the problem of fertility is not insurmountable.

It has been reliably established (Polge & Rowson, 1956; Holt, 1958) that timing is of paramount importance whilst the diluent used is sub-optimal. There is a possibility that coitus or pseudocoitus may play an important part hormonally in advancing ovulation to coincide with service, affecting both fertility levels and litter sizes (Dzuik, 1957; Madden, 1956; Polge & Rowson, 1956). Since pseudocoitus is inseparable from the reliable detection of the pig's readiness to accept service, at the present time it is difficult to unravel the relative importance of actual mounting and the urge to be mounted. Similarly cervical stimulation, whether by penis or catheter, may be directly affecting the ovulating process if applied at the critical time.

When the data is analysed it provides some evidence that fertility levels and average litter sizes are interrelated, and that if fertility is enhanced, the litter sizes will equal those obtained with natural service. This matter will form the subject of a further communication shortly. The author suggests that future published data should include both factors so that the work may be more reliably assessed.

It is felt that further progress might be achieved if the diluent were less attenuative and the spermatozoal survival much greater. Inseminations might then be made earlier during the heat with greater chances of fertilisations taking place after ovulation

(*Concluded at foot of page overleaf*)

Isolation of *Salmonella cholerae suis* from *Post-mortem* Specimens

BY

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SUMMARY.—30 strains of S. cholerae suis *were mixed with pig's intestinal contents and after* 24 *hours' incubation at* 37° *C. only* 11 *were recovered on MacConkey agar and* 29 *on brilliant green-neutral red-lactose agar. Direct plating on brilliant green-neutral red-lactose agar was found superior to the use of selenite-F enrichment medium.*

The use of brilliant green-neutral red-lactose agar and routine cultural examination of pig's gall-bladders resulted in marked increase in isolates of S. cholerae suis *at the Weybridge Veterinary Investigation Centre.*

Introduction

SALMONELLA cholerae suis, the first of the paratyphoid organisms to be discovered (Salmon & Smith, 1885), is a recognised pathogen with a wide zoological distribution but it is found more commonly in pigs than in other animals. It is generally regarded as the most important cause of salmonellosis in pigs, but while in some countries survey results substantiate this view, in others different serotypes are more common (Buxton, 1957, and authors quoted by him). Sojka (1958), at Weybridge, confirmed serologically 35 outbreaks of Salmonella infection in pigs, examined by the Veterinary Investigation Centres in England and Wales, during 1956, and 29 of these outbreaks were caused by *S. cholerae suis*.

Judging by the reported isolations of the organism, the incidence of *S. cholerae suis* infection would not appear high. In a Veterinary Investigation Officers' survey of the incidence and causes of deaths in pigs submitted for diagnosis from November, 1956, to October, 1957, Field (1958) recorded the following figures relating to the isolation of *S. cholerae suis*.

TABLE I

Age group	Number of batches	Number of isolations	Percentage
Abortion and stillbirths	130	None	—
Under 3 days	390	—	—
3–7 days	381	1	0·26
1–3 weeks	568	1	0·17
3–8 „	843	16	1·89
2–4 months	1,003	33	3·29
More than 4 months ...	229	5	2·18
Total	3,544	56	1·58

Progress in the Artificial Insemination of Swine —*Concluded.*

has occurred without the aforementioned hypothetical coital induction. In the field trial described in this communication, it was deliberately decided to restrict the number of variations in technique to the minimum, in view of the major problem presented by the oestral status of the females involved. Whilst this problem is overwhelmingly present, there is little chance that reliable evidence concerning different insemination techniques may be assessed.

With regard to the total results depicted in Table II, it must be borne in mind that the lowered farrowing rate for gilts may not have been due to mechanical obstacles in inseminating; increased difficulties in the detection of the optimal service time; or excitabilty and the counteraction of oxytocin by adrenalin (Hays & Van Demark, 1953). Hancock has observed that young gilts tend to have anovulatory heats up to the third or fourth oestrus (Hancock, 1958). Similarly, the lowered fertility level for repeat services may indicate that some ovarian dysfunction was the cause. Additional data that is now being analysed may throw further light on this aspect.

Acknowledgments.—The co-operation of the staff and Management Committee of the Hampshire Cattle Breeders' Society and the pig breeders who made their animals available is greatly appreciated. The author is particularly grateful for the patience and perseverance shown by Mr. S. H. Williams in his field work and Miss S. M. Downey in computing the data. The helpful advice and support given by Dosent J. Aämdal and Messrs. C. Polge, L. E. A. Rowson, and J. L. Hancock is also warmly acknowledged.

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There is reason to believe that the incidence of *S. cholerae suis* infection in pigs is higher than generally accepted (Scott, 1940; Jörg, 1957), and the difficulty in isolating the organism from contaminated material (Slavin, 1943) may account for the discrepancy. In 1943 Slavin reported that by direct plating on brilliant green-neutral red-lactose agar, 23 out of 28 Salmonella strains, mostly *Salmonella cholerae suis*, were recovered from artificially infected pig faeces, and Smith (1952) confirmed that brilliant green agar was superior to all the other methods, including the use of enrichment media, for primary isolation of the organism.

At the Weybridge Veterinary Investigation Centre, it has been observed on a number of occasions that *S. cholerae suis* was recovered from all organs or gall-bladder or both, but not from the intestinal tract. It was decided therefore, to investigate the effect of pigs' intestinal contents on *S. cholerae suis* and to culture gall-bladders of all pigs sent for laboratory examination.

Materials and Methods

Thirty strains of *Salmonella cholerae suis* and *Salmonella cholerae suis* var. *kunzendorf*, recovered from pigs at Veterinary Investigation Centres, were used. Since the strains were obtained at different times, they were examined in 3 groups of 15, 5, and 10. Specimens of intestinal contents were collected from 3 pigs which did not die of enteric conditions and in which no evidence of Salmonellosis was found. Fresh material from each pig was used for each group of Salmonella.

Media

Brilliant green-neutral red-lactose agar was prepared according to the formula of Slavin (1943) with final concentration of neutral red to 1:10,000 and of brilliant green 1:30,000.

MacConkey Agar: the generally used formula was employed, incorporating 2 per cent. peptone, 0.5 per cent. bile salts, 1 per cent. of lactose, and 1 per cent. of neutral red.

Selenite-F Medium: a modification of the original medium of Leifson (1936) was used; 0.1 per cent. of sodium hydrogen selenite instead of 0.4 per cent. and the *p*H being adjusted to 7.1 with N/1 phosphoric acid. This modification has been in general use for a number of years at the Weybridge Laboratory.

Methods

To overnight Salmonella cultures grown in tubes of 12 c.c. peptone broth at 37° C., quantities of about 1 c.c. of pigs' intestinal contents were added. The tubes were well shaken, and re-incubated at 37° C. After 24, 48, 72, 96, etc., hours of incubation of cultures with intestinal contents, a loop-full from each tube was streaked on a MacConkey and Slavin media, half of the plate being used for each specimen, and 0.5 c.c. placed into selenite broth. The plates were examined after 24 and 48 hours of incubation at 37° C. After overnight incubation the selenite broth was subcultured on to MacConkey and Slavin media, again using half the plate for each specimen; these plates were also examined after 24 and 48 hours' incubation. Colonies resembling

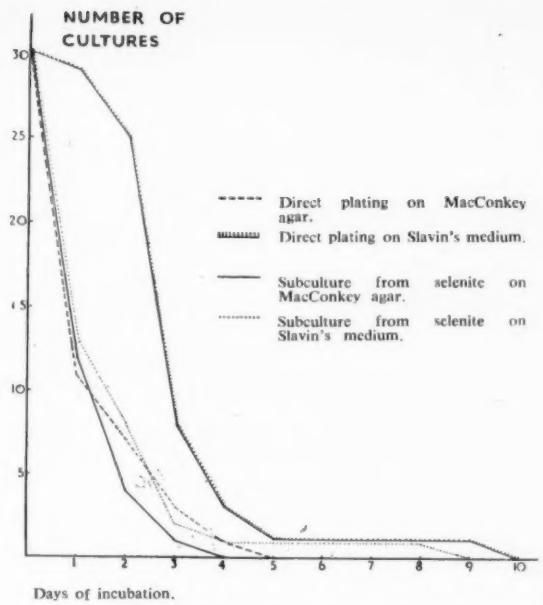

FIG. 1.—Recovery of *Salmonella cholerae suis* after incubation with pig's intestinal contents.

salmonellae were subjected to slide agglutination tests with the Salmonella polyvalent "O" and "H" sera, and if a positive reaction was obtained the culture was subjected to further slide agglutination tests using *S. paratyphi* C H (specific)—"c" and *S. thompson* var. berlin H (non-specific)—"1.5" sera.

Results

These are set out in Tables II and III overleaf:—

Out of 30 strains examined after 24 hours' incubation with intestinal contents, *only 11* (36.6 per cent.) could be recovered on MacConkey and 29 (96.6 per cent.) on Slavin's medium. After 48 hours, 7 (23.3 per cent.) were recovered on MacConkey and 25 (83.3 per cent.) on Slavin's medium. After 96 hours, only 1 strain was recovered on MacConkey and 3 on Slavin's medium. After 10 days, attempts to recover the organism were discontinued (see Fig. 1). Smith's (1952) observation that in dealing with *S. cholerae suis* direct plating is superior to enrichment media was confirmed and Slavin's medium was found much superior to either of the other two methods used.

Discussion

Gaugusch & Kafel (1956) reported on the antagonism between *Escherichia coli* and *S. pullorum*. They streaked a strain of *E. coli* across a plate of MacConkey's agar and after 18 hours' incubation put 4 drops of a broth culture of *S. pullorum* at one end of the plate and inclining the plates so that the broth cultures could flow downwards towards the streak of confluent *E. coli* colonies. After further incubation they found that although the Salmonella broth cultures flowed right across the plate, the growth of Salmonella was inhibited for a short

TABLE II
DIRECT PLATING OF 30 CULTURES OF *S. cholerae suis* INCUBATED WITH PIG INTESTINAL CONTENTS

	Hours of incubation																			
	24		48		72		96		120		144		168		172		196		220	
	Plating on																			
	M	S	M	S	M	S	M	S	M	S	M	S	M	S	M	S	M	S	M	S
Number of cultures recovered	11	29	7	25	3	8	1	3	–	1	–	1	–	1	–	1	–	1	–	–

TABLE III
THE USE OF SELENITE-F ENRICHMENT MEDIUM

	Hours of incubation prior to inoculation of selenite																	
	24		48		72		96		120		144		168		172		196	
	Subcultures from selenite on																	
	M	S	M	S	M	S	M	S	M	S	M	S	M	S	M	S	M	S
Number of cultures recovered	12	13	4	8	1	2	–	1	–	1	–	1	–	1	–	1	–	–

M = MacConkey agar. S = Brilliant green-neutral red-lactose agar (Slavin's medium).

distance on either side of the line of the growth of *E. coli*. The author repeated this experiment with a number of strains of *S. cholerae suis* but without success.

Smith (1952) recorded that *S. cholerae suis* was difficult to cultivate from faeces of other animals as well as of pigs, while other Salmonellae were easy to recover from pig faeces. He was of the opinion that this was not caused by the presence in pig faeces of "bacteria which outgrow Salmonellae but that many of the media used were too toxic to permit the growth of *S. cholerae suis*." In this Centre MacConkey agar proved very satisfactory for primary isolation of *S. cholerae suis* from the usually sterile organs but not from the intestinal tract, unless the organism was so predominant there that it could be recovered in pure cultures. This would indicate that it is the presence of other bacteria, and not the toxicity of the MacConkey medium which prevents the growth of *S. cholerae suis*. Slavin's medium appears to be more specific in inhibiting the growth of bacteria other than Salmonella and the results obtained by incubating cultures of *S. cholerae suis* with intestinal contents seem to confirm it. In the absence of a medium which would inhibit effectively the growth of other bacteria, *S. cholerae suis* will in most cases remain undetected and the chances of its isolation diminish with the time elapsing between the death of the animal and *post-mortem* and bacteriological examinations.

Cultural examination of gall-bladders of pigs submitted for necropsy is very important and the correct diagnosis can often be missed when only the intestinal tract is cultured, especially if the brilliant green-neutral red-lactose agar is not used. Since routine bacteriological examination of pig gall-bladders and the use of Slavin's medium for intestinal cultures were started in this Centre, *S. cholerae suis* has been recovered from 20 out of 158 batches of 6- to 12-week-old pigs received for diagnosis between March 1st, 1957, and September 30th, 1958 (12.65 per cent.), while in a corresponding period ending in September, 1956, when other methods were used, the organism was recovered from only 2 out of 150 batches of pigs of that age (1.33 per cent.). When expressed in the age groups of the Veterinary Investigation Officers' survey, *S. cholerae suis* was recovered from 23 out of 157 batches of 2- to 4-month-old pigs received between March 1st, 1957, and September 30th, 1958 (*i.e.* 14.64 per cent.), though it could not be found in 633 batches of pigs of other ages received at the same time.

In this connexion it is worth noting a statement by Topley and Wilson (1955) that "as Edwards and Bruner (1943) have shown *S. cholerae suis* is far more invasive than the kunzendorf variety; it can often be isolated from the heart blood of infected animals whereas the kunzendorf variety remains confined to the intestines or mesenteric lymph nodes." In this centre, however, 16 out of 18 strains of *S. cholerae suis* var. *kunzendorf*, recovered within the last 19 months, were isolated from all internal organs and heart blood.

The very marked increase in isolates of *S. cholerae suis* noted in this Centre in association with the use of brilliant green-neutral red-lactose agar and cultural examination of pig gall-bladders may indicate that this organism is far more common in pigs than generally accepted and further investigation of its incidence in healthy pigs is called for.

Acknowledgments.—I wish to record my sincere thanks to Mr. A. Shand for the help and encouragement during the foregoing work: to Mr. H. I. Field for permission to quote data from the Veterinary Investigation Officers' survey: and to Mr. W. Soika for supplying the various strains of *S. cholerae suis* and typing the strains isolated at this Centre.

(*Concluded at foot of col.* 1 *overleaf*)

The Role of the Veterinarian in National and International Public Health in the Americas*

BY

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LITTLE more than a decade has elapsed since the term "veterinary public health" first came into use. During this period, the usefulness of the veterinarian in the field of public health has become clearly recognised and a new branch of our profession has developed.

At the end of the last war the scope of public health was changing and broadening to meet the needs of a changing world. The epidemic diseases required less attention but the problems of man's general welfare were assuming greater importance. The concept of health, as later defined in the Constitution of the World Health Organisation, had become man's "complete physical, mental, and social well-being and not merely the absence of disease or infirmity." Greater emphasis was being placed on such general problems as maternal and child health, environmental sanitation, and industrial hygiene; and new problems were being introduced, for example, the influence of atomic energy, and the newer arthropod-borne viruses.

To meet these new needs the integrated public health team was created, a team composed of physicians, nurses, sanitary engineers, dentists, and in a few instances, veterinarians. The objective was to apply the combined knowledge of all the professions represented to the expanded activities of national public health services. The veterinarian's rôle was not only to deal with food hygiene, which has been his traditional rôle for many years, but also to explore all possible inter-relationships of human and animal health.

* Based on a paper presented to the British Caribbean Veterinary Conference, 1958.

Isolation of *Salmonella cholerae suis*—*Concluded.*

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The Pan American Health Organisation

The Pan American Health Organisation† and the World Health Organisation were among the first organisations to recognise the value of the veterinarian as a member of the public health team; a veterinarian was appointed to the staff of Pan American Health Organisation in 1949 and about the same time one joined the staff of WHO in Geneva. Both organisations established rather ambitious programmes for their veterinary public health advisers.

In the case of the Pan American Health Organisation, the objectives of the programme were:—

1. To assist in the prevention, control, and eradication of animal diseases transmissible to man, as well as to prevent the dissemination of human disease by insanitary, unwholesome, or contaminated foods of animal origin.
2. To provide advisory and demonstration services in veterinary public health to governments, and to co-ordinate veterinary public health programmes of neighbouring countries.
3. To encourage improvement of veterinary medical education, and to stimulate training in veterinary public health.
4. To direct research on special veterinary public health problems having international implications.
5. To function as a centre for information relevant to the incidence, prevalence, and control of animal diseases transmissible to man, and to evaluate, process, publish, and disseminate such information.

That was the theory. What has happened in practice?

Firstly, the number of veterinary public health staff of PAHO has grown considerably. There is now an adviser, Dr. Chamberlayne, based on the Washington Office, and 4 others have been assigned to the Mexico City, Guatemala, Lima, and Rio de Janeiro "Zone" Offices, to serve the countries which are included in each zone. Two zones do not, as yet, have full-time public health veterinarians but their needs in this respect are served by those from other zones. Secondly, the "Pan American Zoonoses Center" which is located in Argentina, has been established to provide certain specialised services for the whole hemisphere.

The staff of each zone has worked as a team, or individually, to develop programmes suited to the needs of each country they serve. The veterinarians

† The Pan American Health Organisation serves as the Regional Office of the World Health Organisation for the Americas.

have stimulated interest in veterinary public health at all governmental levels, arranged for special training for veterinarians, and served as advisers to governments on general veterinary public health problems. They have also developed, or improved, control programmes for the zoonoses, especially rabies, brucellosis, and hydatidosis, and have worked with the Organisation's sanitary engineers on problems of food hygiene and environmental sanitation. Yet another field of interest has been the development of courses on public health in veterinary schools and assistance in post-graduate training at public health schools.

These are only a few of the many activities which have been undertaken or organised by the Organisation's veterinary public health staff. It must be obvious that they have needed additional assistance. Special consultants have been appointed for some of the activities such as training courses and seminars or advisory work on a specific disease problem. Visiting consultants have also been used to help plan the teaching of public health in veterinary schools and on such problems as the design and operation of slaughterhouses and the development of laboratory animal colonies. The permanent veterinary public health staff always prepares for and follows up the work of these consultants and thus a great deal of benefit is obtained, even from a short visit by a consultant to a country.

This will give some idea of the way in which the work has been conducted.

Recent Advances

Now let us take a look at some of the recent developments in connexion with the PAHO, and in veterinary public health work in general. The field is too extensive for me to do anything more than to bring to your attention one or two of the more significant advances that have been made.

With respect to the Organisation, the establishment of the Pan American Zoonoses Center in Azul, Argentina, is undoubtedly the most important of recent developments. It will serve as a Center for training in laboratory and field techniques relating to the Zoonoses. It will also provide consultative and diagnostic services and carry out applied research on various aspects of these diseases. Dr. Blood, who was the first veterinary public health consultant to be appointed by the Organisation, has taken over the directorship and is gathering together on his staff a group of physicians and veterinarians who will be able to approach the work from both the veterinary and human health points of view. One course has already been conducted at Azul and several research projects are under study.

Perhaps the most significant and satisfying, although not the most striking, advance in relation to the field of veterinary public health as a whole is the increased attention which this aspect of veterinary medicine is now receiving. Not only are more of our profession entering the field and graduating from schools of public health alongside physicians, sanitary engineers, and nurses but also veterinary schools in Canada, the U.S.A., and several Latin-American countries are giving or planning courses on preventive medicine and public health as a part of their regular curricula. In several schools of public health veterinarians aid in the teaching of epidemiology, microbiology, and food hygiene as well as in the training of auxiliaries such as meat inspectors.

The report of the recent meeting of the WHO/FAO Expert Committee on Brucellosis, which was organised by the PAHO in Lima, gives a fair idea of the progress which has been made in one of the many specific diseases. Although brucellosis is primarily an economic and animal health problem it is also important to human health and mainly through the efforts of WHO, FAO, and PAHO the two aspects of the problem are now considered together. The result has been closer co-ordination of the work of physicians and veterinarians in the investigation of laboratory, preventive, and control methods. Another result has been that the medical profession has added its support to that of the agricultural interests for the development of brucellosis eradication programmes.

In connexion with brucellosis, the tremendous progress which is being made toward the eradication of this disease in the U.S.A. must be mentioned. The programme is too complicated to discuss here but it may be found in the Proceedings of the 60th Annual Meeting of the U.S. Livestock Sanitary Association in 1956 or the FAO/WHO Expert Committee Report.

Rabies has already been discussed very fully by the "panel" in an earlier session of this meeting so there is no need for me to discuss it again. However, I would like to say that the PAHO veterinary public health advisers have been very active in developing control programmes for canine rabies and in the production and distribution of human and animal vaccine in Latin America.

Another topic of common interest to physicians and veterinarians, the arthropod-borne viral encephalitides, has been receiving considerable attention from PAHO. These include yellow fever, Japanese B. encephalitis, Murray Valley encephalitis, and Eastern and Western equine encephalomyelitis, which are better known to the veterinarian. The classification and investigation of the different causal viruses in the laboratory, the study of their epidemiology in the field, and the development of control programmes present a great challenge. Birds and wild animals appear to act as reservoirs in many of these diseases and this poses problems that the veterinarian will, logically, be called upon to help to solve.

The Future

The veterinarian has an important rôle to play in laboratory and field investigations. In addition to the dozens of zoonoses already known there are others which are ill-defined and there must be many more as yet unrecognised. One only has to glance through the medical literature each week to find possible new animal-human disease inter-relationships. Recently it was suggested that the cause of

(*Concluded at foot of adjoining column*)

News and Comment

THE CENTRAL VETERINARY SOCIETY

What sounds to be a meeting of unusual interest has been arranged by the Central Veterinary Society, and will be held on April 2nd at the Royal Veterinary College, by kind permission of the Principal. The meeting will take the form of a joint session with the S.E. Metropolitan Orthopaedic Club, and will comprise papers and discussions in which comparable human and animal problems in orthopaedics are discussed by members of the medical profession and by veterinary surgeons. Visitors will be welcome, and fuller details of the meeting will be found in our Notices column.

DIRECTOR OF NEW U.S.A. LABORATORY

Dr. William A. Hagan, Dean of Cornell, the New York State Veterinary College, who is known to many members of the profession in this country, has been appointed Director of the new animal diseases laboratory which is to be opened by the U.S. Department of Agriculture, Ames, Iowa, next year. Dr. Hagan is an honorary member of the veterinary associations of France, Sweden, and Greece. He has contributed many important papers to the literature, and is the author of a text-book on infectious diseases of domestic animals.

Dr. Hagan has a host of friends both in the United Kingdom and in the world of veterinary science generally. They esteem him not only for his scholarship, but for that quiet geniality of manner which has made him so successful an administrator and so pleasant a colleague.

He has for many years been a representative of the U.S.A. on the Permanent Committee of the International Veterinary Congresses and in many other ways has played a leading part in the development of the veterinary profession and its education. All will wish him every success in his new, important post.

The Rôle of the Veterinarian—*Concluded.*

certain chronic human endocarditis lesions might be brucellosis and not rheumatic fever as was generally supposed. Laboratory findings and a limited amount of clinical follow-up have led to the suspicion that a number of other human and animal diseases, measles, and canine distemper for example, may be related in some way. Such problems require careful investigation and the veterinarian will have to be a key member of the investigating team.

Veterinary public health is being extended to completely new fields as well. Atomic warfare and the peaceful use of atomic energy must be included. Radioactivity may not only affect the health of livestock but may contaminate their products. You may have read of the recent Windscale accident in Britain, where cattle feeding over a wide area in the vicinity of the nuclear power station were found to secrete radioactive milk.

Yet another example of a new field is the breeding of disease-free animal colonies for laboratory research and specialised care of animals used for the production of biological preparations.

I have discussed just a few of the aspects of public health in which the services of veterinarians are being used in the Americas. There are many others which I could mention and, with the present rate of scientific progress, even more may be added in the space of a few years. The horizons are broad. The veterinarian has a real and important contribution to make in the field of public health. International organisations like the Pan American Health Organisation and the World Health Organisation recognise this fact and are doing all they can to encourage countries to utilise veterinarians in this field. Let us, as a profession, go out to meet the challenge wherever and whenever we can.

IN PARLIAMENT

Quarantine Regulations for Dogs

THE DUKE OF ATHOLL (March 11th): My Lords, I beg to ask the Question which stands in my name on the Order Paper.

[The Question was as follows:—

To ask Her Majesty's Government whether the period of quarantine for dogs entering this country from abroad could be done away with, provided that they are inoculated against rabies.]

The Joint Parliamentary Secretary, Ministry of Agriculture, Fisheries and Food (EARL WALDEGRAVE): My Lords, while my right honourable friend and I sympathise with all those who have to place their dogs in quarantine when they bring them to this country, we are absolutely convinced that this precaution must be retained. Strong support for this view was given by a Committee appointed by the World Health Organisation in 1951, which recommended that countries which are free from rabies should continue either to prohibit the import of dogs and cats or to subject them on importation to a long period of quarantine, preferably six months. Unfortunately, inoculation does not confer complete immunity, and I need hardly remind your Lordships that rabies is a terrible and fatal disease, for human beings as well as for animals.

THE DUKE OF ATHOLL: My Lords, while thanking the noble Earl very much for his reply, I was wondering whether the period of quarantine could not be reduced for dogs which are temporarily taken out of this country, and which have been inoculated before they left.

EARL WALDEGRAVE: My Lords, I do not think we could contemplate reducing the period of quarantine. I would add that inoculation does not give a complete immunity. In the United States, where inoculation is practised, there are some 4,000 to 5,000 cases of rabies a year.

THE WARBLE PROBLEM

Speaking at a meeting of the Upton-on-Severn branch of the N.F.U., Mr. I. G. Shaw, M.R.C.V.S.,

said that farmers in this country may soon have a new drug to help them fight warble fly infestation in cattle. It was of American origin, but because of certain side-effects it was not yet marketed in this country. He also referred to another American technique of dealing with the fly, which was the sterilisation of male flies by irradiation.

Mr. Walter Scott, D.V.O., said that if farmers throughout the country carried out conscientiously their obligations in dealing with the fly, infestation in this country could be wiped out in 3 or 4 years.

UNIVERSITY NEWS

Edinburgh

The undermentioned candidates have passed in the subject of Veterinary Obstetrics of the Final Professional Examination (Part II) for the degree of Bachelor of Veterinary Medicine and Surgery:—

Anderson, David A. Y.; Anderson, William G. F.; Atkinson, William I.; Booth, James M.; Care, Anthony D.; Davies, David W.; Davis, Marjorie A.; Gordon, Mary C. M.; Gunn, Sydney D.; Harris, Grenville W.; Henry, Robert R.; Hunt, George E.; James, William T.; Jones, Alan P.; Ker, John; Lawson, Gordon H. K.; Lovett, Charles I.; Marshall, Leslie; Mathieson, Andrew O.; Munro, David; Neill, Robert H.; Nicholson, Graeme G.; Seymour, Stanley; Simpson, David T.; Swift, Thomas; Turnbull, Robert W.; Ure, William S.; and Watt, John G.

The undermentioned candidates have passed in the subject of Veterinary Preventive and State Medicine of the Final Professional Examination (Part II) for the B.V.M. & S. degree:—

Anderson, David A. Y.; Anderson, William G. F.; Booth, James M.; Care, Anthony D.; Davies, David W.; Davis, Marjorie A.; Gordon, Mary C. M.; Gunn, Sydney D.; Harris, Grenville W.; Hunt, George E.; James, William T.; Jones, Alan P.; Ker, John; Lake, David E.; Lawson, Gordon H. K.; Logan, Ernest F.; Lovett, Charles I.; MacLeod, Brenda R.; Marshall, Leslie; Mathieson, Andrew O.; Munro, David; Neill, Robert H.; Nicholson, Graeme G.; Seymour, Stanley; Simpson, David T.; Swift, Thomas; Watson, Ewen E. B.; and Watt, John G.

Liverpool

Dr. Bengt Andersson, Reader in Veterinary Physiology in the Royal Veterinary College, University of Stockholm, who is in this country under the Foreign University Interchange Scheme, visited the University on March 9th and 10th. During his visit, Dr. Andersson gave two lectures on some aspects of hypothalamic function, which were attended by a large and representative gathering of members of the academic staff and students of the veterinary and other faculties, and of members of the veterinary profession in the Lancashire and Cheshire areas. All those present were greatly impressed by Dr. Andersson's masterly exposition of his subject, and by the excellence of the films which were shown.

THE REGISTER OF VETERINARY SURGEONS

The name of Alne Edward Cameron, V.S. (ONTARIO), was entered on the Commonwealth List of the Register of Veterinary Surgeons on March 9th, 1959.

THE SECOND B.S.A.V.A. ANNUAL CONGRESS

The second annual congress of the British Small Animals Veterinary Association opened yesterday (Friday) at the Washington Hotel, Curzon Street, London, under the Presidency of Mr. C. E. Woodrow, and continues over the week-end. This note is written before the congress opens, but a large attendance is expected to hear the excellent variety of papers which are being provided. Films, discussions, and a symposium will further enhance the programme, and a number of social events, some of them of especial attraction to the delegates' ladies, have been arranged. A commercial exhibition forms a useful and interesting complement to the scientific and professional sessions.

The published Proceedings of this Association's first congress formed a most useful volume of real value to veterinary surgeons in small-animal practice, and there seems every reason to expect that this second congress will provide equally helpful contributions to the literature. We wish our colleagues in this venture every success and enjoyment.

R.C.V.S. OBITUARY

We record with regret the deaths of the following members of the profession:—

HARE, Tom, of 529a, Finchley Road, London, N.W.3. Graduated Liverpool, July 16th, 1921. Died March 17th, 1959.

MICHIE, Norman George, 40, Ivy Terrace, Edinburgh. Graduated February 4th, 1928, at the Royal (Dick) Veterinary College, Edinburgh. Died March 7th, 1959, aged 52 years.

PERSONAL

Birth

SOMMERVILLE.—On March 10th, 1959, to Norma, wife of John Sommerville, M.R.C.V.S., of Glen Fruin, Greenfield Road, Stafford, a daughter, Lisa, sister for Fiona.

COMING EVENTS

March

25th (Wed.). Spring Meeting of the Lincolnshire and District Division at Eastgate Court Hotel, Lincoln, at 2.15 p.m.

Ordinary Meeting of the Sussex Veterinary Society at the Old Ship Hotel, Brighton, 2.30 p.m.

General Meeting of the Lancashire Veterinary Association at Alderley Park, Cheshire, 2.30 p.m.

Meeting of the South East Midlands Veterinary Association at Franklin's Gardens Hotel, Northampton, 7.30 p.m.

26th (Thurs.). Meeting of the Shropshire Veterinary Club at the Oak Hotel, Shelton, Shrewsbury, 8 p.m.

April

1st (Wed.). Meeting of the R.A.V.C. Division at Glaxo Laboratories Ltd., Greenford, Middlesex, at 11 a.m.

2nd (Thurs.). General Meeting of the Society of Practising Veterinary Surgeons at Langford, Bristol.

All-day Meeting of the Central Veterinary Society with the South-eastern Metropolitan Orthopaedic Club at the Royal Veterinary College, Camden Town, N.W.1, 12.30 for 1 p.m.

2nd and 3rd (Thurs. and Fri.). The 21st Ordinary General Meeting of the A.V.T. and R.W's. will be held at the Gleneagles Hotel, Scotland, at 10 a.m.

4th (Sat.). Symposium of the Scottish Group of the Nutrition Society in Glasgow.

13th Annual Dinner of the B.R.X. Club at the Royal Veterinary College, 6 p.m.

7th (Tues.). Reception and Dance of the Shropshire Veterinary Club at the Lion Hotel, Shrewsbury, 9 p.m.

8th, 9th and 10th (Wed., Thurs., and Fri.). B.V.A. Committee and Council Meetings in Edinburgh.

25th (Sat.). Meeting of the B.S.A.V.A. North West Region at the Stork Hotel, Liverpool.

May

1st (Fri.). Reception and Dance of the Midland Counties Veterinary Association at the Mount Hotel, Tetterhall Wood, Wolverhampton, 9 p.m.

August

30th to 5th September. 77th Annual Congress of the British Veterinary Association in Folkestone. (Official opening Monday, August 31st.)

B.V.A. COMMITTEE AND COUNCIL MEETINGS IN EDINBURGH

Wednesday, April 8th, 1959—at The Royal (Dick) School of Veterinary Studies

10.00 a.m. Farm Livestock Committee.
11.30 a.m. Parliamentary and Public Relations Committee.
2.15 p.m. Small Animals Committee.
5.00 p.m. Finance Sub-committee.

Thursday, April 9th, 1959—at The Royal (Dick) School of Veterinary Studies

10.00 a.m. Home Appointments Committee.
11.30 a.m. Veterinary State Medicine Committee.
2.15 p.m. General Purposes and Finance Committee.

Friday, April 10th, 1959—at The Royal (Dick) School of Veterinary Studies

10.00 a.m. Council Meeting.

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax

Ches. Walnut Tree Farm, Bradwall, Sandbach; Soughans Farm, Shocklach, Malpas (Mar. 13).
Herts. Beeches Manor Farm, Brent Pelham, Buntingford (Mar. 16).
Northants. Decoy Farm, Postland, Crowland, Peterborough (Mar. 10); Gravel Pits, Station Road, Earls Barton (Mar. 12).
Perth. Stank Farm, Callander (Mar. 16).
Suffolk. Oakenhill Farm, Badingham, Woodbridge (Mar. 11).
Worcs. Highfields Farm, Knightwick (Mar. 11).

Fowl Pest

Essex. The Hall, Canvey Road, Canvey Island (Mar. 11).
Lincs. Church Cottage, Cold Hanworth, Hackthorn; Side Bar Lane, Heckington, Sleaford (Mar. 11).
Surrey. 21, Croydon Lane, Banstead (Mar. 12).

Swine Fever

Ches. Oak Cottage, Antrobus, Northwich (Mar. 10).
Denbigh. Fron Farm, Llanfynydd, Wrexham (Mar. 13).
Devon. Lower Eastcombe Farm, Stockleigh Pomeroy, Crediton (Mar. 16).
Essex. Home Farm Cottage, Southend Road, Sandon, Chelmsford (Mar. 12); The Willows, Nathans Lane, Writtle, Chelmsford (Mar. 13).
Flints. Coleshill Farm, Flint (Mar. 12).
Hereford. Ivy House, Fownhope (Mar. 16).
Kent. Speedgate Farm, Fawkham, Dartford (Mar. 16).
Lancs. Whinney Lane Piggeries, Staining, Blackpool; Rainhill Hospital Farm, Rainhill, Liverpool; 17, Moss House Road, Marton, Blackpool (Mar. 16).
Leics. Meadow View Farm, Walton-le-Wolds, Loughborough (Mar. 13); Drummond Road Piggeries, Leicester (Mar. 16).
Salop. Stanlow Farm, Pattingham, Wolverhampton (Mar. 11); Lower House, Whixall, Whitchurch; 118, Belton Abbots, Cross Houses, Shrewsbury (Mar. 12).
Somerset. Honeygar Farm, Westhay, Glastonbury; Oakfields, Ham, Combe St. Nicholas, Chard (Mar. 10); 12, The Mead, Street; Piggeries, Somerton Hill, Mowries Farm and Etsome Road (Mar. 16).
Surrey. Conerside, Lyne Road, Virginia Water (Mar. 12).
Sussex. Old Park Farm, Warninglid, Haywards Heath; Rout Farm, Warninglid, Haywards Heath (Mar. 12).
Witts. Manor Farm, Crudwell, Malmesbury (Mar. 11); Parsonage Farm, Cricklade, Swindon (Mar. 13).
Worcs. Piggeries, Sheepcote Farm, Stourbridge Road, Bromsgrove (Mar. 10).

DISEASES OF ANIMALS ACT, 1950—GREAT BRITAIN

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period			Anthrax	Atrophic Rhinitis	Foot-and-Mouth	Fowl Pest	Sheep Scab	Swine Fever
16th to 28th Feb., 1959			14	—	1	34	—	49
Corresponding period in	1958		9	1	12	14	—	30
	1957		21	—	—	29	—	30
	1956		212	1	4	13	—	25
1st Jan. to 28th Feb., 1959			35	—	1	181	—	174
Corresponding period in	1958		31	1	91	166	—	169
	1957		72	2	11	191	—	139
	1956		500	2	4	125	—	103

Letters to the Editor

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

Clinical Problems in Everyday Practice

Sir,—Miss Pinkney's letter in your issue of March 7th has its lighter side, especially since the outcome (bar an unnecessary second operation) was a happy one thanks to the very good sense of R.S.P.C.A. Inspector Nairn, but it does spotlight the dangers of well-intentioned but ignorant interference by so-called animal lovers, and the very curious and difficult legal position regarding ownership and euthanasia of cats.

Some years ago a woman doctor client of mine called me to attend an adult cat which had been in her possession for two years; she had taken it in as a stray and despite widespread enquiries, notices and advertisements, no claimant had been forthcoming and she had therefore kept the cat herself.

As a result of a street accident the cat acquired a ventral hernia, I repeat, two years after she had taken him in; this was dealt with surgically but when I arrived to remove sutures some ten days after operation I was told the cat had gone into the garden that morning and not returned; this was unusual since he was rarely out for longer than two hours. When the cat failed to return by evening, enquiries were made of welfare society clinics and veterinary practices in the district. It was quickly established that the cat had been presented at a welfare society clinic that morning with a request for euthanasia, which was duly performed. Despite the fact that the cat had a long and obvious surgical incision still fully sutured on its abdomen, no questions were asked of the "owner" and the animal was destroyed. The woman doctor was greatly concerned, and so was I, and legal opinion was taken. It appears that a cat is a chattel in law and unless it has actually been made over to a new owner as a gift it is still technically the property of the original owner despite the lapse of time and he may therefore dispose of it as he wishes. In this case the cat had been taken to the clinic by a person claiming to be its former owner and as she was leaving the district she decided to have it destroyed although she had not seen it for two years.

In another case a cat which had had an abscess lanced by a veterinary surgeon some days previously and which had an incompletely healed wound as a result was seen in the street by a lay person, who called a welfare society's ambulance and insisted that the cat be destroyed forthwith.

In the case of free roaming animals such as cats it is impossible to keep them confined indoors for long periods after veterinary treatment (and it is unnecessary), nor is it usually possible to have a name and address attached; hence it behoves everyone in a position to carry out euthanasia, particularly those employed by welfare societies who have to heed public demand, to be very sure indeed that the person presenting an animal for destruction has a good title to its ownership, especially when there is evidence of recent surgical intervention to be seen.

I had always believed that to destroy an animal which was under treatment by someone other than oneself was the most serious form of supersession but apparently this is not so. Again, in view of the fact that an animal is a chattel in law, an owner may dispose of it how and when he wishes, so that anyone requested to destroy an animal is ethically in the right in so doing provided he is satisfied as to bona fide ownership.

There must be many similar cases which could be quoted but it has long concerned me that cats in particular have so little protection against the ill-advised inteference of members of the public, sometimes with the too willing co-operation of "euthanasia-happy" personnel. Is there, I wonder, any way in which we as a profession can lessen the risk to our convalescing feline patients of an untimely end?

Yours faithfully,
JOAN O. JOSHUA.

78, Brentway,
Finchley, N.3.
March 10th, 1959.

Sir,—May I claim the indulgence of your columns to reply to the letter by Miss Jean M. Pinkney, which appeared in your issue of THE RECORD dated March 7th.

At the outset let me state that, neither in my article, nor yet when the method was described orally at the Central Division meeting, did I make any claim to originality.

The subject was aired by me firstly, because I have adopted this method during most of my 21 years of practice and found it successful. Secondly, because I had never before seen the method described in any of our literature, nor had I met any other veterinary surgeon who knew of it.

If it be true that Mr. George Dykes employed this method before it had occurred to me to do so, then I, far from feeling hurt by the suggestion, am pleased that the laurels should rest on their proper shoulders.

Yours faithfully,
J. MARSHALL.

183, Upper Richmond Road,
Putney, S.W.15.
March 10th, 1959.

Escherichia coli Infection in Lambs

Sir,—I was most interested to read the report of *Escherichia coli* infection in lambs by Terlecki and Shaw (*Vet. Rec.* **71.** 181.), as I have recently been presented with a similar outbreak.

Affected lambs could not walk properly and were making circling movements. One lamb, which was submitted to the Veterinary Investigation Centre at

Wolverhampton, died with the head and neck arched back and the legs in extension.

The *post-mortem* report stated that coliforms were obtained from the brain and also, in rich culture, from all levels of the intestines. As there was a little milk in the stomach it would seem in this case that the portal of entry was the mouth. It is rather surprising that Terlecki and Shaw were not able to obtain cultures from the intestines, particularly of Case No. 2 which lived for a week and presumably must have suckled.

Yours faithfully,
J. N. WRIGHT.

80, Mickleton Road,
Earlsdon, Coventry.
March 9th, 1959.

An Aerosol for Bitches in Season

Sir,—I write to draw the attention of my colleagues to an aerosol* which has just come on the market for use on bitches in season. I realise that the evidence on which this letter is based is purely reports by clients, but my object in writing is to bring to the notice of others a product which I have found appreciated by clients.

Some two years ago I was approached by a consulting research chemist to try out an aerosol spray which, it was claimed, not only deodorised but was actually repellent to dogs. It is fair to say that I agreed to give this product a clinical trial rather with my tongue in my cheek, thinking that it was probably as good as, but no better than, various similar products already available.

As a result of my clients' reports my opinion is quite different from that anticipated. I understand from a neighbouring colleague that her experience with this preparation is similar to mine and that reports from clients in that practice have been equally favourable (Joshua, 1959).

Clients to whom this spray was given were carefully selected for reliability, in addition to being bitch owners who either suffered considerable nuisance from street dogs or who had a dog living on the same premises with bitches. With one exception all clients have given favourable reports; some have been so enthusiastic that they have bombarded me with demands to know when the aerosol would be on public sale during the rather long interval between the finishing of my trial supplies and its very recent marketing.

There is little doubt that the claim that the spray has repellent action in addition to the reputed deodorant action ascribed to chlorophyll is not unfounded. This gives the product an additional use in that it prevents further fouling of one's premises by subsequent dogs when a patient has already urinated in surgery or waiting room. In this respect it is markedly superior to the usual deodorants I have previously used.

The product is an aerosol containing chlorophyll and certain essential oils of vegetable origin dissolved in a mixture of fluorocarbons. I feel sufficiently convinced of its usefulness to have asked local chemists and pet stores to stock it in order that I may be able to tell clients where they can obtain it. It is also, of course, obtainable direct to veterinary surgeons should this be desired.

It will be appreciated that, in common with other like products, normal care must still be taken of on heat bitches. It is merely that nuisance is minimised and exercise considerably facilitated by its use, both valuable properties in these days of dense dog population in heavily built-up areas.

Yours faithfully,
C. G. HOPSON.

17, Sneath Avenue,
N.W.11.
March 14th, 1959.

* Skipit, Airkem Ltd., 28, Sackville Street, London, W.1.

Reference

JOSHUA, J. O. (1959). Personal communication.

"Eclipse" and Sainbel

Sir,—With regard to Mr. Barber-Lomax's letter, I was particularly interested in his reference to the arrangement of the bones in the "Eclipse" skeleton.

Some few years ago, I had the opportunity of viewing the skeleton (together with those of "St. Simon" and his son "Persimmon"), at the Natural History Museum in South Kensington. "Eclipse" had a very peculiar action, which was attributed to his croup being higher than the withers. This feature was not evident in the skeleton, but I have never seen vertebral spines so completely fused. The straightness of the "St. Simon" shoulder also illustrated a deviation from the original.

These skeletons have not been on view to the public for some time, but are stored in the basement. "Brown Jack" is on display also, together with the stuffed "Mick the Miller."

Yours faithfully,
VICTOR DOWLING.

Mallow,
Co. Cork.
March 8th, 1959.

Game Eradication

Sir,—It was with interest that I read Mr. H. E. Hornby's letter in your issue of January 10th of this year.

One cannot but be amazed at the assurance with which the protagonists of the slaughter of wild animals uphold the game eradication policy as the way in which trypanosomiasis may be controlled. E. F. Whiteside (1958) discusses some 18 different methods including fly-free cattle corridors; insecticides on animals; game fences; fly traps; sprayed insecticides; bush clearing; land usage; burning; biological sterilisation and radioactive sterilisation of male flies. He gives very scant reference to game annihilation which is not practised in Kenya, but which accounts for, I believe, more than 25,000 head a year in Southern Rhodesia.

Even in Uganda, where a game slaughter policy is being carried out in the Ankole area, the tsetse fly has been, according to Robertson (1958) driven from 1,700 square miles of country in Karamoja to the Sudan border by selective bush clearing—an anti-

trypanosomiasis measure known since 1923. Bush clearing is regarded in Kenya merely as a part of land development—of the process of turning unproductive bush into cultivation and grazing (Whiteside, 1958). The game eradication campaign in the Ankole area of Uganda, whose main purpose, we gather, was to stop the spread of the tsetse fly into Masaka, was chosen on the grounds principally of cheapness, and we read that the destruction of irreplaceable herds of ungulates in the Ankole area, instead of bush clearing, makes a saving of £300 a square mile (Robertson, 1958). The total number of game killed in this area of Uganda is some 50,000 animals over the last dozen years. If there are going to be any results from the modern attempt to institute a policy of game management and utilisation, the saving of £300 a square mile may in future years come to be regarded as one of our classic economic farces. Bush clearing has failed to eliminate the tsetse fly in certain areas, but so has the slaughter policy failed to prevent the spread of fly to Masaka where its presence is now officially admitted.

Other successful measures against tsetse fly have been the extirpation of *G. palpalis* by insecticides in the Kuja Migori river system in South Nyanza, the Nyando river basin in Kenya (Wilson, 1953) and in the Malawa and Bukedi districts as well as in several other areas. Excellent work is being done at the present time by a study of the fly habitat: it appears from this work that the habits of the tsetse fly are so predictable that his habitats may be sprayed selectively with the use of only a small part of the former insecticide expenditure (Annual report, Kenya 1957). In the same report we read of results with the use of fly traps both with and without "attractants." Some success has also been achieved through the feeding of insecticide to cattle by mouth so that these cattle act as bait to haematophagous flies (Annual report, Kenya 1955 and 1956).

Trypanosomiasis in cattle is typically a chronic and not an acute disease, which responds to treatment with various drugs. It cannot be compared, therefore, with diseases such as foot-and-mouth, rinderpest, contagious bovine pleuropneumonia, and a host of others which present their problems in Africa and for which there is no specific treatment apart from prophylactic vaccination.

The chemotherapy of trypanosomiasis has made great strides since its first real success with antimosan in 1928, and it is already possible to send cattle into infested areas under drug "umbrellas" using compounds such as prothidium, which last for some 5 months and under some conditions considerably longer. Besides prothidium there are a number of drugs such as phenidium, dimidium bromide, antricide, berenil and novidium, and it is almost certain that even greater advances will be made in the chemotherapy of this disease in the near future. There is also the very interesting work of Dr. Soltys (1958) suggesting that an immunity to trypanosomiasis may be induced, and the "biological sterilisation" method of fly reduction (Vanderplank, 1947) on the basis of which a tsetse population was greatly diminished in Tanganyika. The possibly successful method whereby sterilised males are released to compete with the fertile ones, as was done so successfully to combat the screw-worm pest on the island of Curacao, may be mentioned also.

Recent studies on the feeding habits of the tsetse fly may assist other methods of control, and they reveal that he is very selective with regard to diet and will tend to feed on his favourite food if that is available. Clearly there is a vast field of study along these lines, and already there are a number of reports available. To choose one at random, work at Kiboko in Kenya showed that *G. longipennis* prefers the rhinoceros, as 130 out of 164 squashes of tsetse meals tested proved to be rhinoceros blood. The remaining feeds were from buffalo (23), ostrich (4), giraffe (3), elephant (2), lion (1), and pig (1). No kongoni (hartebeest) impala or Grant's gazelle bloods were identified among those tested, although all of these animals were present in greater numbers than the others (Annual report, Kenya 1957).

It would seem, Sir, that an outmoded policy of animal destruction is being pursued in several parts of Africa without real grounds except that its immediate cost is less than more advanced and scientific methods. Furthermore, it is being perpetrated on the very debatable grounds that the antelope, gazelle, buffalo, etc. have no value. The study of these magnificent animals is only beginning, and we are as yet almost completely ignorant of their habits, food utilisation, incremental rates and migration cycles. While the first reports are beginning to come in on their probable value as providers of protein food under a policy of game management, we should pause before completely destroying what is virtually, as yet, an unknown quantity. We may be called to account for our misuse of such natural resources by present and future generations.

Yours faithfully,

Makerere College, A. M. HARTHOORN.
University College of East Africa,
Kampala, Uganda.

March 9th, 1959.

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Skin Grafts as an Aid to Intestinal Anastomosis

Sir,—Against my better judgment I feel drawn to reply to comments made regarding this procedure by Messrs. Hole and Littlewort (*Vet. Rec.* **71.** 199). I would make quite clear that the miserable experiences referred to are most definitely my own, but would add that in discussing this problem with quite proficient small-animal surgeons, the general feeling has been that results have not been on the level one would like to associate with surgical procedures.

The main problem facing any practitioner advocating such an alternative procedure is that this type of

case unfortunately (or fortunately) occurs relatively infrequently in the average practice. I would not dispute that it is possible to join two portions of intestine of equal diameter by a variety of methods with varying degrees of satisfaction, and I agree that, to date, the method described by Markowitz is probably the one most often chosen. I have used the method I described for all types of anastomosis, but there seems to be one set of circumstances when it has several practical advantages. After removing a section of intestine following a bad " solid " intussusception one is faced with joining two portions, one very often almost double the diameter of the other. I find this a very difficult procedure, and only since using the skin graft have I closed the abdomen feeling reasonably confident of the end result. In the last 18 months I admit I have only performed 3 operations under these circumstances, but all the patients recovered uneventfully with, as yet, no after effects. I am sure that had I used any other method all three would not have survived. Whether other workers would have obtained the same results, using another method, is pure conjecture. As a practitioner I survive on the survival of my patients; opinions can be raised for or against most matters, but surely if I reduce the mortality rate, that in itself is an overwhelming justification for my use of such a technique, and any relatively minor complications which may—or may not—arise at a later date are worth while.

The allusions to the original work of Armistead seem a little biased; there was a slight structure in the dog destroyed 6 weeks after the operation, but I feel that this would have been the case after such a short period following the use of any method. No measurements were given for the dogs destroyed at 3 and 6 months, but photographs of the specimens, microscopical sections, and Armistead himself, indicate that the skin graft was progressively absorbed so that at 6 months very few traces of it were still to be found. He raised equally strong arguments in favour of the technique and it would seem, admittedly only on his 3 cases, that the efficiency of the anastomosis from the point of view of stenosis was dependent only on the accuracy of original alignment of the bowel layers in the first stage of the operation.

When I originally presented this paper before the Central Veterinary Society I hoped that it might be of help to others with similar feelings to my own. I realised that the number of cases I had then undertaken (and this applies equally now), were insufficient to substantiate decisively any opinion I offered; but I also felt that my own results were very promising and that I should be a very old man before my numbers would be convincing. I hoped that the wider use of the procedure would enable a truer evaluation to be made, based on actual operations performed; I know of no one establishment where the numbers would be sufficient.

Yours faithfully,
D. G. LEWIS.

Hillcrest,
1a, Weston Road,
Strood, Kent.
March 12th, 1959.

Dried Egg in Birds' Food

Sir,—Recently two African Grey Parrots were presented to the out-patients' department for examination. One of these birds showed a slight mucous discharge from one nostril but there was no history of serious disease. During the course of the examination it was noticed that the birds had excreted green faecal material which is, of course, not normal. Material was submitted for bacteriological examination.

The faecal material was seeded in selenite broth and plated on D.C. and MacConkey medium from the selenite. On culture, some white colonies were picked for further study. These proved, by biochemical examination, and on both tube and slide agglutination, to be Salmonellae of the Taksony/Senftenberg group.

The owner had been questioned as to whether any egg or egg product was fed to the parrots, and stated that the only egg product supplied was the dried egg yolk included in the parrots' seed mixture. She sent a sample of this egg, and this was treated bacteriologically in the same way as the stool sample. The egg sample produced a rich growth of *Bacillus coli*; in addition a Salmonella of the same group as that from the stool sample was isolated.

It has been shown by one of us (Fiennes, 1959) that *Bacillus coli* is one of the major alimentary pathogens in Psittacidae and the discovery, therefore, in the dried egg yolk, presumably of Chinese origin, that both *Bacillus coli* and a pathogenic Salmonella were present is of obvious interest and importance. The desirability of mixing these egg products in seed mixtures for Psittacines or any grain-eating birds is obviously open to question.

Yours faithfully,
OLIVER GRAHAM-JONES,
Veterinary Officer.
R. N. FIENNES,
Pathologist.

The Zoological Society of London,
Regent's Park, London, N.W.1.
March 16th, 1959.

Reference

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Salaries in the Veterinary College of Ireland

Sir,—Further to the letter appearing recently in THE VETERINARY RECORD by Mr. Magee, President of the Irish V.M.A., in support of the demand of the veterinary profession in Ireland for adequate salaries for the veterinarians employed by the Minister for Agriculture, it should be noted that successive governments in Ireland have never appreciated or recognised the value to the State of their veterinary staffs.

If the present Minister will make a short survey, and compare the work accomplished in the eradication of animal diseases in this country compared with any other country in Europe or the U.S.A., he will be forced to the conclusion that the Irish veterinary profession, instead of demanding equality of remuneration with their colleagues elsewhere may well be entitled to far more generous treatment. There is, for example, no country where swine fever has been

eradicated as it has been in Ireland by the veterinary staff.

As far as I am aware, no Irish Minister has ever recognised this great boon to the Irish pig and bacon industry. As a practical illustration of this failure to see and appreciate the value to the nation of the work of the profession, the Slaughter of Calves Order clearly indicated the attitude of the Government of the time, which is that of the same party as is in power to-day. The Minister at that time was appealed to by Mr. Norris, the chief veterinary officer, who suggested that if it was necessary to reduce the number of livestock it would be better to commence with old uneconomic cows; the Minister refused to consider this proposal. No doubt posterity will remember the head of that Government as the Herod of the Irish livestock industry.

Ireland has been kept free from foot-and-mouth disease, and during the last widespread outbreak the veterinary officers worked night and day, Sundays included. An application was made for extra remuneration for Sunday work, and after some time, 25s. per day was granted; yet the first 10 Sundays did not count for this award ! In view of the importance of expediting tuberculin testing to preserve our important export of livestock to Great Britain, surely it is essential that there should be an adequate and contented staff ?

Our livestock export trade is of as much importance to Great Britain as to Ireland, and therefore, it is hoped that British veterinarians will give support to the very moderate demands of their Irish colleagues.

Yours faithfully,
ESMONDE W. LITTLE.

4, Lower Fitzwilliam Street,
Dublin.
March 9th, 1959.

Observations on Artificial Insemination of Pigs

Sir,—Mr. Holt, in his most interesting and detailed analyses of the results obtained in pig A.I. at Dartington Hall, raises one or two points which call for further elucidation.

He relates behaviour of the female to fertility, and one would have thought this to be due not only to the correct stage of oestrus at which insemination was carried out, but also to the greater chance of the technician in being able to make an intra-uterine insemination in the quieter animal. His Table III(G), however, shows no improvement in fertility between those animals where semen has apparently been deposited in the uterus, and those where penetration has not been successful. On a few animals I have inseminated in Cambridge since March, 1956, using a 4 mm. o.d. nylon catheter, it appears that intra-uterine insemination may greatly affect fertility. Forty-six intra-uterine services produced 32 litters, average size, 10.6, while 18 inseminations, where the semen was not deposited in the uterus, yielded 10 litters, average size 8.0.

Mr. Holt states that 100 to 150 c.c. of semen is in excess of that required for normal fertility, but 18 services I performed using only 50 c.c. gave a farrowing rate of 50 per cent. compared with 64.7 per cent. on 51 services carried out with 100 c.c. May it not be that the more semen we use the greater the chance of some of it reaching the utero-tubal junction ? The double nylon catheter I have used was introduced for general use at the Cambridge Centre in January, 1958, and so far results are slightly up on previous years' figures with some 250 animals served once, although, of course, the technique is more difficult and requires more time to be successfully carried out.

He excuses the low fertility by suggesting that all his inseminators were performing pig A.I. instead of a selected few. Here we employ all our main Centre technicians to inseminate pigs, and despite several staff changes they have improved farrowing rates from 28.1 per cent. in 1955 to 40.3 per cent. in 1958. However, I would endorse Mr. Holt's suggestion for more serious training for pig inseminators as distinct from cattle workers, and I believe the success of the Japanese workers may be in part attributed to the care they take in training. Our two workers, who inseminate pigs under conditions where time is not so important, have achieved farrowing rates of 60.8 per cent. and 51.7 per cent. on some 69 and 29 first services respectively.

Yours faithfully,
V. J. A. MANTON.

The Gravel Pits,
Huntingdon Road,
Cambridge.
March 10th, 1959.

Two Cases of Suspected Bovine Malignant Catarrh

Sir,—In your issue of March 7th (p. 191) a case of suspected bovine malignant catarrh is described by Messrs. Pyke and Gripper. I should like to draw their attention to the report of the proceedings of the Conference on Metabolic Disorders and other problems related to Grassland and Fodder Crops and Innovations in Animal Husbandry, held on November 20th and 21st, 1952, by the British Veterinary Association. On pages 88 and 89 a condition known to practitioners in Northern Ireland as "brown nose" or " copper nose " in cattle is described. This condition resembles malignant catarrh. It is certainly not uncommon, and if I recollect correctly, Mr. George Gould, of Southampton, is very familiar with the condition. A number of veterinary surgeons in England have described very similar cases to me. All the cases have one thing in common : the first symptoms are noticed on grass; " peeling " of the muzzle and teats in the milking cow is common and many cases show involvement of the C.N.S. before death. The herd incidence is low, usually not more than one or two animals being affected.

I have known the condition to be diagnosed as bovine malignant catarrh, as photosensitisation, and as acute mucosal disease. I congratulate Messrs. Pyke and Gripper and would support them in drawing attention to this condition.

Yours faithfully,
H. G. LAMONT.

Veterinary Research Division,
The Farm,
Stormont, Belfast.
March 10th, 1959.